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Worldwide Report

TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT

(FOUO 19/81)

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CONTENTS

JAPAN

ACTIVITIES OF MAJOR OPTICAL FIBER MANUFACTURERS REPORTED

Tokyo NIKKAN KOGYO SHIMBUN in Japanese 29 Oct 81 p 15

[Text] Optoelectronics entered the practical stage only because low-loss fiber and the long-life semiconductor laser became practical items, and the contribution of high-quality fiber is especially large.

About the time the Corning Company succeeded in the epochmaking development of glass fiber with the extremely low loss of 20 decibels per kilometer and the Bell Laboratory announced its method of manufacturing new optical fiber base material in the latter half of the 1965 decade, Japan's efforts in the optical fiber area were being accelerated. Up to that time, there had been scattered research on the part of cable companies and communication makers focused mainly on multiple component low-loss glass, but since 1975 the Nippon Telegraph and Telephone Public Corporation and three electrical cable maker companies (Sumitomo Electric Industries, Furukawa Electric, and Fujikura Cable) initiated joint research in this area. In 1979 these parties succeeded in developing optical fiber with a loss of 0.2 decibels per kilometer, which made it the best in the world in this respect, and Japan has been enjoying top position in the area of fiber technology since then.

At the present time, the optical fiber makers, centered on the electrical cable makers, are developing their independent technology and hanging on to their own products as they are responding to the expanding and diversifying needs of the market.

Furukawa Electric has doubled its optical fiber production capability over that of 1980 to 4,000 kilometers. This past January, this company together with Fujitsu jointly received an order for 4,000 kilometers of optical communication network from the Hong Kong Telephone Company, thereby greatly enhancing its position in the field.

It was about 1970 that this company took up the subject of optical fibers seriously, and a joint agreement for coordinated research was reached between three companies--Corning Glass, Fujitsu, and this company--in 1973, as a result of which there was a sudden acceleration in development. Then, the highest level four-core optical cable was developed in 1974, and a line was set up at its Chiba plant. This cable is still operating today without mishap, ably demonstrating the high quality of optical fiber cables. Since 1975 this company has been engaged in joint research with the Nippon Telegraph and Telephone Public Corporation, and in 1978

it entered into an agreement with the Corning Company. This company presently is producing top-quality fiber both by the CVD method and the VAD method.

Looking at the orders this company has been receiving over the past few years, there was the order from Nippon Steel in 1977, from Tokyo Electric in 1978, from the Japan Atomic Energy Research Institute and the Agency of Industrial Science and Technology in 1980, the order from Hong Kong in January of 1981, and from Northern Telecom by way of Corning in August 1981.

This company is not satisfied to limit its efforts only to quartz system fibers, but is pointing toward high-quality optical fiber development and wider use of image guides and is enhancing its ability to handle orders for systems.

Sumitomo Electric initiated basic research on optical fibers in about 1965 and entered into earnest research on low-loss quartz optical fiber development along about 1970. Since it initiated joint research with the Nippon Telegraph and Telephone Public Corporation, this company has been looking toward mass production, and it also initiated joint research with the electric power companies on power control. It has been participating in second-phase and third-phase joint research programs with the Public Corporation. Both domestic and foreign orders began to increase starting about 1978; it has received orders from Nippon Steel for information transmission at its Yawata Steel Plant, for subways, for an ITV system for a high-speed railroad, from Disney World, and from the Brazil Telephone Public Corporation. Of special note is the joint order received with Nippon Electric last year from Argentina for expanding that country's communication system over a 5-year plan involving 3,020 kilometers of installations requiring a total of 8,000 kilometers of optical fiber.

The method of manufacturing optical fiber parent material is the VAD method (axis attached method), which is a strictly Japanese method developed in joint research with the Public Corporation. Since the VAD method is adaptable to mass production, it has good capability of responding to sharply increasing demand.

This company estimates that this year's total sales in the optical communications area will total more than 5 billion yen, including sales in industrial use image fiber, optical fiber voltmeters and photo components (split wave devices, switches), compound semiconductor production projects, and all optical fiber related technology. It anticipates that sales this year will total 5 billion yen.

Fujikura Cable entered the field of optical fiber development early in the game and is a member of the top group in Japan in this area. One of its past achievements which can be cited here is its success in commercializing the silicon-clad optical fiber in 1973. This was the first commercial product for signal transmission. In 1976, it came out jointly with the Public Corporation with the successful development of an extremely low-loss optical fiber. This is a 1.2 micron fiber with the very low loss of 0.47 decibels per kilometer, and this may be said to be indicative of the high technological level of this company. During the past year it has been engaged in developing optical fibers without the peak which appears in the loss level and has established the position of optical fibers as replacement for copper cables in communication transmission.

Because this company has fairly little interplay with communications equipment makers, it has suffered considerably in the international market, but in July it received an order from the mainstay of optical fibers, the Bell Laboratory of the United States, for 65 kilometers of optical fiber for use in submarine cables, and this company appears about to make expansions in this area.

While sales in the public communication area to the Public Corporation account for the major share of this company's production, recently it has been developing sales in the private sector, such as the recent sales for ITV systems used in subways such as the Kyoto subway and for control systems of high-speed highways. Because it does not have any specific partner in this area, it has the advantage of teaming up with any maker, and it is reinforcing the production capability of its Sakura plant, dedicated solely to optical fiber production, to 3,000 kilometers per month.

Showa Electric Wire and Cable Company is the top maker in the area of multicomponent glass optical fiber. To be sure, this company is developing and producing quartz optical fiber just as any other company. This company is pushing development of high-quality quartz fiber for long-distance transmission use and the multicomponent glass fiber which can be produced in mass quantity at low cost for medium and short distance communication.

The features of multicomponent glass fiber include the free selection of the opening number of light impulses which can be accommodated by the cable, the large size of core which can be used, and the good coupling with the light source. Its low melting point also enables ready splicing. When the distance of transmission is small and the volume of communication is not too large, the comparatively large loss rate (7-8 decibels per kilometer) compared to quartz fiber is not too much of a problem. That is why this company is pushing expansion in use of this fiber in the area of intraplant communications, computer data bus, CATV, and observational control transmission type applications.

Various multicomponent systems and quartz systems are being produced at its Sagamigahara plant, where the monthly production is about 1,000 kilometers. Series linking of peripheral equipment with optical fiber such as data link is also under development.

Since last year, Hitachi Cable has been operating its headquarters → market development and service, laboratory → product making, plant → manufacturing system development centered on its optical system development headquarters to promote development and production of optical fibers and associated equipment. Joint research was initiated on optical fibers with Hitachi Limited from about 1971, and the results are appearing in the form of unique development not seen in other companies.

Joint research on practical technology related to systems control was initiated by Tokyo Electric and Kwansai Electric in 1976. In 1980, success was achieved in setting up a 2-kilometer HF analog transmission system through joint research with NHK by which wide area television (large number of scanning lines with good image) transmission systems were made possible. At the same time, there has been a large increase in orders for items such as the data Fourier system for the Kimizu steelmaking plant of Nippon Steel and the ITV observation system for the high-speed highway, and sales totaling more than 1.5 billion yen are anticipated for this year.

The elliptical jacket type polarized waved plane retention fiber which this company announced in July of this year maintains the vibrational plane (polarized plane) of light in a fixed direction as light is transmitted, and this factor coupled with its low loss are expected to find wide application for this fiber in optical communications, gyroscopes, and magnetic flux gauges.

In addition, this company has developed blood pressure measurement devices using optical fiber which are expected to find many uses in diagnosing and treating cardiac patients, blood pressure measurements during the postsurgery stage, and general observation use.

Dainichi-Nippon Cables' quartz optical fiber is a product of joint research with Mitsubishi Metals and is a solely developed MRT (modified rod in tube) method technology. The features of optical fiber produced by the MRT method include the separate melt-forming of the core and cladding such that the dimensions can be adjusted at will.

It is possible to produce fibers ranging from small diameter (6 microns) for communications use to large diameter fibers (1,000 microns) for power transmission which are very readily adapted to medical and sensor applications. This company exploited the features of this MRT type fiber to market an image guide. In the past, image guides were used for stomach cameras, but the large transmission loss limited its length to 2-3 meters; the development of quartz fibers has made possible transmission of clear images over more than 100 meters, which has made optical fibers useful in nuclear power, blast furnace, and metal flaw detection uses as well as many other uses.

This company is also working toward serializing data links according to need. The splicer developed by this company (melt joining device) uses butane gas, does not require an electric power supply, and is low in cost, which makes it a highly evaluated product.

Dates of Optical Electronics Development and Practical Introduction

Year	Event
1953	Invention of glass fiber by Ban-hiru [phonetic]
1960	Invention of laser
1970	Corning Company: invention of low-loss glass fiber (20 decibels/kilometer) Bell Laboratory: invention of semiconductor laser
1974	Bell Laboratory: announcement of low-loss optical fiber by the MCVD method (1.1 decibels/kilometer)
1975	Nippon Telegraph and Telephone Public Corporation, Furukawa Electric, Sumitomo Electric, Fujikura Cable initiate joint research
1978	Haiobisu [phonetic] initiated at Eastern Ikoma
1979	Nippon Telegraph and Telephone Public Corporation joint research group: development of low-loss optical fiber by the VAD method with 0.2 decibels/kilometer loss
1980	Musashino Laboratory of the Public Corporation, Fujitsu, and Nippon Electric joint research: development of semiconductor laser with life greater than 100,000 hours.

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TIME AND FREQUENCY SERVICE USING CUBAN NATIONAL TELEVISION CHANNELS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 81 pp 39-41

[Article by Yu. A. Fedorov and J. Gonzales: "Transmission of Time and Frequency Units via the Channels of Cuban National Television"]

[Text] The NTSC color television standard has been adopted for television broadcasting in the Republic of Cuba. Balanced quadrature modulation of one chrominance subcarrier frequency is employed in this system for the transmission of the color difference signals. The nominal value of this frequency should meet the conditions for compatibility of color and black-and-white television and should have no impact on the quality of black-and-white and color images. For this reason, the chrominance subcarrier in the NTSC system was chosen at 3.579545... MHz, while the repetition rate of the horizontal lines and fields of the composite TV signals are 15,734.264... and 59.94... Hz respectively [1].

With these frequency values for the sync pulses, both passive and active techniques can be used to reference time scales to each other [2]. The passive method requires the simultaneous recording at two points of the same frame sync pulses with the subsequent exchange of data from the measurement results, while the active method provides for the transmission of special code groups incorporated in the TV signals, where these groups carry information on the time position of the frame sync pulses relative to the reference standard time scale.

The practical implementation of these techniques involves the organization of an additional communications channel in one case, and in the other, the utilization of complicated and expensive transmitting and receiving-recording equipment of limited precision, which is governed by the discrete nature of the transmitted data and its reproduction based on the second time signals.

Experience in the USSR with the design of synchronization systems for time scales using television channels shows that time signals with different repetition rates and a high degree of precision in their matching to the scale of the state time and frequency reference standard can be continuously transmitted as part of the television signals [3]. In this case, the transmitting and receiving-recording equipment is substantially simplified and high precision, reliability and a high confidence level in linking the time scales of spatially separated facilities without supplemental information exchange are assured [4 - 6].

It follows from an analysis of the techniques of generating high and low frequency sync pulse components in the NTSC system that for a definite relationship between the time signal repetition period and the frame sync pulses, the time signals can be transmitted continuously as a part of the television signals just as in the SECAM system, adopted for TV broadcasting in the USSR. In this case, the time position of the frame sync pulses and the time signals will remain unchanged for the duration of an entire transmission.

To assure that the time signals coincide with the frame sync pulse once per second, this relationship is determined from the expression:

$$T_{r.p.} = N/f_f \quad (1)$$

where $T_{r.p.}$ is the repetition period of the time signals; f_f is the frequency of the TV signal fields, equal to 59.94... Hz; N is the number of TV signal fields, equal to 60.

To obtain the precise value of the time signal repetition period, it is necessary to use coefficients which relate the value of the chrominance subcarrier frequency to the sync signal scanning frequencies. In this case, the relationship between the reference standard frequency signals of the master oscillator of the television center, having a nominal value of 5 MHz, and the chrominance subcarrier f_0, is established from the expression $f_0 = k \cdot 5$ MHz, where $k = 63/88$ [7]. On the other hand, the frequency of the TV signal fields is related to the number of horizontal lines in the television raster, $z = 525$, and twice the horizontal line frequency, $2f_z$, by the function:

$$f_f = 2f_z/z \quad (2)$$

In this case:

$$2f_z = 4\frac{f_0}{2n+1}, \quad (3)$$

where $(2n + 1) = 455$ is a coefficient chosen in step with the degree of perceptibility of the interference from the chrominance signals [1].

The simultaneous solution of (1) - (3) yields:

$$T_{r.p.} = T_{c.s} = \frac{z(2n+1)N}{20k} \cdot 10^{-6}. \quad (4)$$

All of the quantities in (4) are finite numbers, and for this reason, the precise value of the time signals repetition period, which continuously coincide with the NTSC standard TV signals, is equal to 1.001 sec and is a multiple of 1 msec.

The functional configuration of the reference standard time and frequency signal (ESChV) transmission system using the channels of Cuban national television, which is shown in Figure 1, was developed in accordance with (4); the equipment complex was breadboarded from transmission, monitor and control equipment, as well as receiving and recording equipment. Experimental studies of the constructed system were conducted in June of 1979 in the Havana television center.

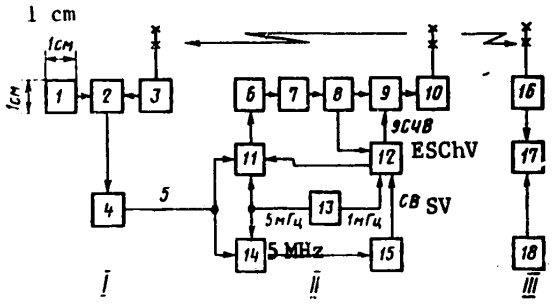

Figure 1.

Key: ESChV = Reference standard time and frequency signals;
SV = Time signals.

The 5 MHz signals from master oscillator 13 of television center II, for which a Ch1-69 rubidium time and frequency standard is employed, are fed simultaneously through the frame sync pulse equalizer 11 and the time signal equalizer 14 to the chrominance subcarrier frequency synthesizer 6 and time signal generator 15. The time signals take the form of a train of pulses with a repetition period of 1 msec and a width of 2 μsec. To resolve the ambiguity in the second intervals, pulse width modulation is used for the time signal pulses with a repetition period of 100 and 1 Hz with widths of 5 and 15 μsec respectively.

In accordance with (4), the time signals with a repetition period of 1 msec coincide once per second with the interval authorized for the transmission of the second half of the 10th line of the frame blanking pulse. In this case, the frame pulse matches each time with the next time signal having a repetition period of 1 msec. Thus, all signals with a repetition period of 1 msec will be transmitted sequentially during the specified time. This means that the signals modulated by the pulses with a repetition rate of 100 Hz will be transmitted once every 10 seconds and those with a repetition period of 1 Hz, once every 1,000 seconds.

Then the time signals generated by the method indicated above are fed simultaneously with the harmonics of the 1 MHz frequency from the other output of the rubidium Ch1-69 standard to block 12 for generating the time and frequency reference standard signals. Block 12 is coupled to the television program source 8, the sync signals to which are fed from the output of sync generator 7, operating in an external synchronization mode from the reference standard signals of the chrominance subcarrier frequency, which are fed from the output of synthesizer 6.

A 149A test signal generator made by the Tektronix company, having a special input for external signals, was used as the device for feeding the reference standard time and frequency signals into the TV signals during the experimental transmissions. The reference standard time and frequency signals, in the form of sinusoidal packets at a frequency of 1 MHz, positioned in the first part of the 10th line with a width of 15 μsec, and the time signals positioned in the second portion of this line, are fed from the output of test generator 9 to the television transmitter 10 of the

Havana television center and to the input of a radio relay link which transmits the central television programs throughout the entire territory of Cuba.

The instant of time signal output from the TV transmitter antenna according to the time scale of the working reference standard 1, located in the time and frequency laboratory of INIMET, is determined remotely via a telephone line, 5, which ties the monitor and control center I to the transmitting television center II. For this purpose, the time signals from the output of the type RTV-Ch receiving and recording unit [8], 3, are fed to the "stop" input of time interval meter 2, where the seconds signals from the output of the working reference standard 1 are fed to the "start" input of this interval meter. Based on the results of these measurements, taking into account the travel time of the signals from the TV transmitter antenna to the monitor station, the instant of time signal output is varied until the signals match the scale of the working reference standard by means of the signal controller, 4, which generates special voice frequency pulse trains which are fed via the telephone line to the input of the time signal correction unit 14. In this case, an additional correction is made in the time position of the frame sync pulses by means of changing the phase of the 5 MHz signals fed to synthesizer 6 so as to place the time signals in the interval of the 10th line authorized for their transmission, where this change is accomplished only during the frame blanking period to attenuate the influence of the phasing on the color video quality.

The time signals are segregated from the composite television signal at the station for tying the time scales together, III, by means of the type RTV-Ch receiving and recording unit, 16, and the time signals are fed to the "stop" input of time interval meter 17, where the seconds signals of the local clocks 18 are fed to the "start" input of this meter. Based on the results of these measurements, taking into account the time of signal travel from the point of their transmission to the reception point, the deviation of the instant of the local clock seconds signal from the time scale of the INIMET working reference standard is determined.

Figure 2.

An example of the results of recording the time signals at the monitor and control center is shown in Figure 2, not taking into account the systematic shift in the time scales of the transmitting television center and the INIMET working standard. The instant of signal reception was recorded by means of a Ch3-34 time interval meter with a resolution of 10 nsec and was recorded on paper tape with a numeric printer concurrently with the data on the current time values from the output of the electronic clocks.

An analysis of these results indicates the high phase stability of the television transmission and reception channels, which is on the order of tens of nanoseconds.

However, in the period when the experimental studies were performed on the transmission system, it was also determined, for example, that changing the alignment of the TV receiver leads to a change in its delay of up to 0.2 to 0.4 microseconds, depending on the reception conditions, frequency band and type of TV receiver.

The experimental data obtained make it possible to conclude that with minimal material outlays and simple transmitting and receiving-recording equipment, there is possibility of synchronizing the time scales of spatially separated facilities with an error on the order of $(1 - 5) \cdot 10^{-11}$ over 1,000 seconds with respect to frequency and 0.3 to 0.5 microseconds with respect to time over practically the entire territory of the Republic of Cuba.

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SWEDEN

NEW TECHNOLOGY SEEN OVERWHELMING TELECOMMUNICATIONS AGENCY

Stockholm VECKANS AFFARER in Swedish 12 Nov 81 pp 52-57

[Article by Carl-Olof Johard]

[Text] Recently the Telecommunications Service noted record profits of 2.5 billion kronor. Behind these outstanding figures, however, is a monster that, while not on feet of clay, is overwhelmed by the new technology in the field of telecommunications. This has created new fields in which to do business--which has set the agency on a collision course with other companies. The need for investments is enormous, to say the least, and the Telecommunications Service has been forced to cut back in this area. At the same time, the scope of the agency's activities that was determined by parliament as recently as 1 year ago was soon exceeded. Director general Tony Hagstrom dismisses the critics by saying, "We are not striving for a monopoly and we ourselves have proposed narrower limits."

When Tony Hagstrom assumed the leadership of the Telecommunications Service's orange-colored troops in 1977, succeeding the previous director general Bertil Bjurel, an active chapter was begun in the history of the Telecommunications Service.

The transition from electromechanics to electronics meant not only a costly and demanding reorganization, but it also opened new and extremely lucrative markets for the Telecommunications Service. Previously these markets had been enjoyed only by private industry.

Of course, the feverish expansion was accompanied by sharp disagreements with the already established industry, resulting in attention from the mass media, piles of antitrust complaints, and questions in parliament.

In recent years, the accusations of "monopolistic tendencies" have been many, to say the least. Quite simply, the electronic revolution has developed so rapidly that our parliamentary system has not managed to keep up. Legislation and limitations on monopolies have become rapidly outdated.

The proposal of December last year that limited the monopoly of the Telecommunications Service had hardly been approved before voices were raised in parliament and in the business world against the antiquated law.

"Of course, the proposal presented by the communications minister at that time, Ulf Adelsohn, was a step in the right direction, but subsequent events have shown that it is insufficient. We must clarify as soon as possible how this proposal is to be implemented," member of parliament Anders Bjorck, Conservative Party, said.

The present government is also considering this matter.

Legislators Cannot Keep Up

"With the rapid development in this field, legislation soon becomes vague," current communications minister Claes Elmstedt said.

According to the December parliamentary resolution, the Telecommunications Service's monopoly is now limited to include only equipment for voice communications over the public network, as well as certain modems (transmission equipment that transmits signals into the telephone network).

The Comvik case is an example of the difficulty in having one law that covers such an expansive sector as the telecommunications market. The department simply forgot about mobile telephones, which has now given rise to the notorious conflict between Comvik and the Telecommunications Service.

Comvik with its 2,000 customers presently accounts for 10 percent of the mobile telephone market, while the Telecommunications Service is responsible for the rest. As long as the Telecommunications Service's mobile telephone exchanges were completely electromechanical the division of responsibility between Comvik, or Foretagstelefon as it was called at that time, and the Telecommunications Service was clearly defined.

For 15 years Comvik has been permitted (by contract according to Comvik, by dispensation according to the Telecommunications Service) to operate its private mobile telephone network, where previously all calls made via Comvik's exchange were transferred manually.

The transition to electronic or digital technology, however, means that calls go out directly over the public telephone network. According to the Telecommunications Service, this is a threat to the agency's right and duty to manage the public telecommunications network. If Comvik is allowed direct access to the line, a precedent will have been established and the Telecommunications Service's responsibility for the system will have been eroded.

For its part, Comvik believes that since the company is already part of the network, no new precedent is established and the action of the Telecommunications Service is nothing but an attempt to eliminate an unwanted competitor

from the market.

"Through its actions and its monopolistic claims, the agency is exceeding its authority. If the Telecommunications Service wants to extend its monopoly by declaring the private networks part of the public telecommunications network, it must not do this surreptitiously through selective type approvals, but by open resolutions by the board of directors so that these resolutions can then be submitted to the government for consideration," Comvik director Anders Runer said.

The commissioner for freedom of commerce, who handled the case, is in complete agreement with Comvik and believes that the Telecommunications Service's sudden awakening was somewhat unusual. The Telecommunications Service should increase competition gradually, according to the commissioner, who said that this case raises the concern that the Telecommunications Service is proceeding in the opposite direction.

"In our opinion it is not entirely clear that the Telecommunications Service should have a monopoly on mobile telephones and since Comvik is already in the market, we believe that Comvik should remain, even with the new technology. The matter has been turned over to the government and it is the government and parliament that must make the final decision in this matter," Sven Sahlstrom, department head of the Freedom of Commerce Office said.

Communications Minister Claes Elmstedt said:

"We are now examining the matter and will make a thorough study based on the 1980 parliamentary resolution."

Telefax Companies Had 2 Years to Cease Activities

Text communication, i. e. telex, telefax, and teletex, is another area that has caused legislative problems and where the Telecommunications Service has been sharply criticized for its "monopolistic tendencies."

The Telecommunications Service's share of the telefax market--a device that is connected to the telephone network to transmit print, drawings, etc.--is just over 50 percent and the number of customers is currently 2,200. Telefax was introduced in the spring of 1979 amidst great protests when the Telecommunications Service maintained that it had a monopoly on telefax services and gave companies in the field 24 months to cease operations.

The commissioner for freedom of commerce soon received stacks of letters from the Swedish Data Processing Association, the Federation of Swedish Wholesalers and Importers, the Federation of Swedish Industries, and others. As the matter dragged on longer and longer, the attitude of the Telecommunications Service became less harsh and after the action by the commissioner the agency itself took the initiative in drafting the new proposal for more

clearly defined groundrules on the monopoly.

This has not silenced the competitors, however. In the telefax market, the Telecommunications Service is now being accused of price cutting.

"The price policy of the Telecommunications Service is subject to criticism. Its prices on telefax equipment are almost 50 percent below those of its competitors. This is not sound business practice. Are telecommunications customers paying for this?" asked Bo Hedberg, head of the Office and Data Processing Equipment Trade Association (LKD) of the Federation of Swedish Wholesalers and Importers.

The commissioner for freedom of commerce recently dealt with a complaint concerning price cutting involving telephone answering devices, since the Telecommunications Service did not pay sales tax, which its competitors must do. Similar complaints have also been sent to the Internal Revenue Service.

"It is perfectly clear that the Telecommunications Service must also pay sales tax and this situation must be corrected," said Sven Sahlstrom, commissioner for freedom of commerce.

Competitors in the new teletex field also believe that the Telecommunications Service is attempting to circumvent the resolutions of parliament by making the business activities of private competitors more difficult in various ways. According to the plans of the Telecommunications Service teletex, which originally was an advanced development of telex but 30 times faster and with services related to office automation, will be introduced in November 1981 with service beginning in 1982.

At the same time the Telecommunications Service is beginning an expensive marketing campaign, it is also announcing that its competitors will be connected to the teletex network only 18 months later.

The Telecommunications Service says it needs this time to test its unique new combined service equipment, the so-called screen, through which the service's private competitors must be connected to the data network. This means that companies choosing the Telecommunications Service's own teletex can communicate with teletex equipment throughout the world from the very beginning. In other words, the Telecommunucations Service will have a 1.5 year head start on its competitors.

"This is an unusual action that finds no support in the law. The Telecommunications Service has no monopoly on teletex services, since teletex is a service that has been designated for competition," said Bo Hedberg of LKD.

Data communication is another disputed field. This is one of the most expansive areas within the Telecommunications Service. During the 1980/81 fiscal year sales amounted to 243 million kronor, a 30 percent increase in

fixed prices over the previous year. According to the Telecommunications Service's own predictions the number of computer terminals will increase from the present figure of 30,000 to 86,000 in 1987, i. e. an annual increase of 20 percent.

Controversial Parliamentary Resolution at "Five Before Midnight"

Along with the other Nordic telecommunications agencies, the Telecommunications Service is establishing a special data transmission network, the general data network, which will rationalize and increase data services and also provide protection against unauthorized access.

The first stage includes equipment for connecting 4,000 customers. It is estimated that by the mid-1980's 14,000 customers will be connected to the general data network, a capacity that experts in the field believe to be far below demand.

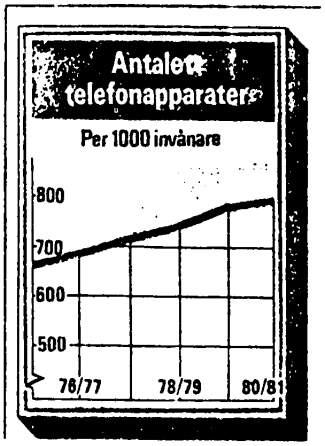
Apart from the monopoly question, debate on the fluid boundary between the business and agency sides of the Telecommunications Service has come more and more to the fore.

The fact that the Telecommunications Service in its capacity as an agency tests the equipment of its competitors before such equipment is allowed into the network was the subject of heated debate, even when parliament and the Communications Committee dealt with the new proposal last year. In order not to make too radical a change in the present system, parliament decided to instruct the Telecommunications Service to create an independent testing unit within the agency--independent even of the director general. It was suggested that a special appeals board be appointed with two members from the Telecommunications Service and three outsiders. The board was to be financed by the Telecommunications Service. This, however, was insufficient, according to opponents.

"Why should the Telecommunications Service not be subject to the same objective testing as other companies. According to the law on test sites, testing should occur completely independent of the Telecommunications Service. The agency that sets the regulations cannot be the testing site, as well. I am a member of the agency that designates testing sites and we have proposed the National Institute for Materials Testing for the telecommunications equipment," said member of parliament Sture Palm, Social Democrat, who also believes that the proposal was written much too hastily and then approved by parliament the last night in December at "five before midnight."

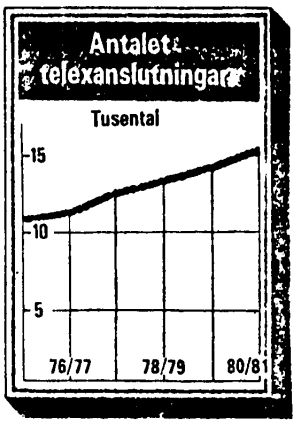
The commissioner for freedom of commerce agrees totally with Sture Palm:

"We believe that the tests should be conducted by an independent agency outside the Telecommunications Service. The double role of the Telecommunications Service as an authority and a business is most unfortunate," Sven Sahlstrom said.



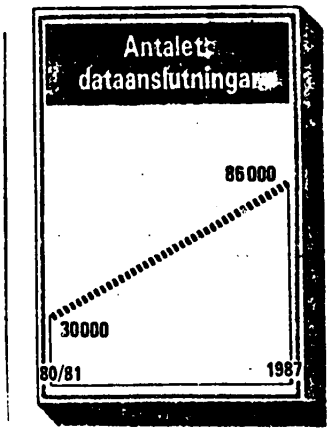
Sweden now has 772 telephones per 1,000 inhabitants. Only the United States has a greater percentage.

Key: Number of telephones per 1,000 inhabitants.



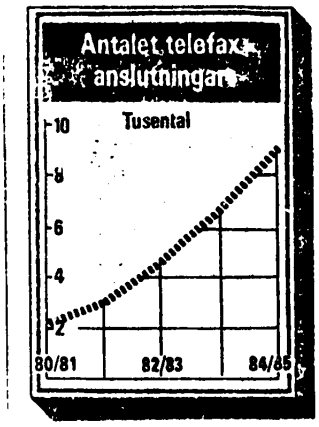
There are now 15,944 telex terminals, a 6.6 percent increase over the previous year.

Key: Number of telex terminals (thousands).



It is estimated that the number of computer terminals will increase by 20 percent per year to 86,000 in 1987.

Key: Number of computer terminals.



It is expected that telefax, which was introduced in 1981, will increase by 30 to 50 percent annually during the 1980's.

Key: Number of telefax terminals (thousands).

Director general Henric Bildt of the National Institute for Materials Testing said that the testing could be transferred easily from the Telecommunications Service to the National Institute for Materials Testing.

"It is dangerous to maintain, as the Telecommunications Service does, that state agencies need not operate on the same principles that must be accepted by private business. We have not yet taken a position on this question, but we believe that if the Telecommunications Service would simply determine the requirements, we are competent to take over the actual testing," Henric Bildt said.

This matter is also on the desk of the communications minister.

"We are following the matter continually and the criticism against the present system is totally understandable. I believe there is reason to intervene in this matter," Claes Elmstedt said.

On the background of this fluid boundary, the agency is also being accused of making large profits from its telecommunications subscribers and then transferring the profits to the business side of the agency to be used in the price war in competitive sectors. It is maintained that in this way maintenance and expansion of the network are suffering.

"We have written to the Telecommunications Service and pointed out that the network is overburdened. There is strong suspicion that the Telecommunications Service has neglected to expand the network at the required rate," said Nils Lundqvist, chairman of the Telecommunications Committee of Private Industry and Commerce, a kind of lobbying group for customers led by large companies such as Asea, SAS, Volvo, and Electrolux.

The fact that reliability, service, and maintenance are subject to criticism was indicated recently by a survey taken by the Stockholm Chamber of Commerce among its members. All the responses expressed strong discontent with the Telecommunications Service's treatment of its customers.

Dissatisfied Customers Arrange Hearing with Telecommunications Service

"Our members are disturbed by how the service is working. This concerns services such as price quotations, installation, delivery time, and material purchases. In addition, several of the companies are quite large with subsidiaries abroad and thus have an opportunity to compare the service with service in other countries," said Martin Carlstein, head of the section on public economic policy at the Stockholm Chamber of Commerce.

The Chamber of Commerce, which has conducted similar surveys on other state agencies such as the post office, the Swedish State Railway, the Customs Office, and the National Civil Aviation Administration, indicates that previously it has not encountered such widespread and massive discontent. In order to soothe these customers' indignant feelings somewhat, the Chamber of Commerce

plans to arrange a hearing with the Telecommunications Service in late November. The Chamber of Commerce also intends to approach the government on this matter at a later date.

The Telecommunications Service has chosen to blame the poor service and long waiting periods, primarily in and around Stockholm, on delayed shipments, which has greatly angered LM Ericsson, which says that this is a downright lie and that the blame lies entirely with the Telecommunications Service.

One concession by parliament to the demand--made even by the Telecommunications Service--for a clear delineation within the Telecommunications Service between the business section and the agency was the creation of Teleinvest, the holding company that presently conducts the business endeavors of the Telecommunications Service. Several competitive activities are still within the scope of the agency, however, including data, teletex, and telefax.

"If no clear lines are drawn between the agency and the business aspects, the monopolists must be prepared for constant battles in parliament. The discontent is so widespread that each individual question involving the Telecommunications Service will be the subject of debate," Anders Bjorck said.

Relations with customer, supplier, and development partner LM Ericsson have not yet been seriously disturbed, however.

"But the situation can change, of course, if the Telecommunications Service continues to expand its activities," said director Bjorn Svedberg of LM Ericsson.

Interview with Tony Hagstrom

The Telecommunications Service has become somewhat of a continuing story at the Freedom of Commerce Office. What monopolistic tendencies does the Telecommunications Service have?

"We have no monopolistic tendencies whatsoever. The state has simply given us the task of maintaining the overall responsibility for Swedish telecommunications and this is what we are attempting to do--and it is a simple fact that Sweden is the world's bargain basement when it comes to telephones."

What are the limits on the Telecommunications Service's monopoly? The law is quite vague on this point.

"No, it is not vague at all. Our monopoly includes two area--two-way voice communication and certain modems. These lines are based on the requirements of our responsibility for the system, so that we can assume the full responsibility. I would also maintain that we at the Swedish Telecommunications Service are unique in that we ourselves recommended to the state

authorities a clearer and narrower delineation of the monopoly. I believe that no other telecommunications authority in the world has done that."

Are mobile telephones within the scope of the monopoly?

"We believe that the resolution of parliament is unambiguous, although I admit that this is not explicitly stated in the proposal. Of course, if we had had any idea that a debate would arise on this point we would have requested a clarification."

Now the government must take a stand on this issue. If the government says that mobile telephones are open to competition, then I believe that this would be a departure from the proposal and parliament must then correct its decision."

Then competition must apply only to manual exchanges?

"No, these manual exchanges are also included in the monopoly, but for many years Comvik has been granted dispensation. With the new digital exchanges, mobile telephones will become like any other telephone. Comvik's mobile telephones will be connected automatically to the telephone network and we are not prepared to allow this."

Are you afraid of setting a precedent if Comvik is included in the telephone network?

"It would be a curious situation if Comvik were given the exclusive right to connect automatic exchanges to our network. This would mean that Comvik had a monopoly on competing with the Telecommunications Service as far as the network is concerned. The alternative is to open the network to everyone and in that case I believe there would be no difference whatsoever between exchanges and then we would have to formulate a totally different telecommunications policy for this country."

Do you want to eliminate Comvik from the market through competition?

"No. If we had wanted to eliminate Comvik we simply would have demanded that Foretagstelefon, as the company was called previously, pay off its debts to us. In that case, the company would have gone bankrupt."

"Instead, we have written off some of the debts. We devised payment plans for them precisely to prevent the company from going bankrupt and so that its customers would not be inconvenienced in the process. We chose that course of action because we believed that Foretagstelefon complemented our activity in the market and because we were living in peaceful coexistence."

The Telecommunications Service, with its so-called screen, will keep its competitors out of the new teletex field for 18 months until October 1983. Is this not interference with free competition?

"When this accusation was presented to the Freedom of Commerce Office several years ago, the office turned thumbs down on the industry's accusations. The actual situation is that the so-called screen promotes competition instead of impeding it."

"First of all, it will be a kind of "Checkpoint Charlie" with respect to traffic into and out of the teletex network. We can limit our control to the actual network. In this way, we can avoid regulations and terminal inspections, which we have to make otherwise."

"Secondly, we would relinquish our telex monopoly in practice, since in the long run teletex will take over the functions of telex. By making it possible for both teletex and other text processing equipment to communicate with telex, we are also preparing for total competition in this market. It is obvious, then, that the manufacturers are protesting--what manufacturer does not want to tie his customers down to his own system."

Can a single monopoly meet the expected high demand for services within the general data network?

"Yes, we are studying developments and making predictions for Sweden on the basis of European information. We will have no problems whatsoever matching expansion with increasing demand."

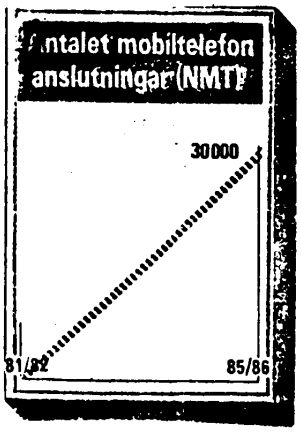
The Telecommunications Service recently placed a large teletex order with Philips. Why do you not buy Swedish products to a greater extent?

"With regard to this matter, we accepted a large number of bids for teletex terminals, resulting in an order with Philips worth 85 million kronor and LM Ericsson received an order worth 45 million kronor, but the Telecommunications Service and LM Ericsson were to conduct development work jointly in certain important areas. LM Ericsson subsequently purchased a majority interest in Datasaab and a new situation has arisen. Discussions are presently underway with LM Ericsson on how the agreement should be adjusted with regard to the new situation."

Teleinvest's purchase of the Norwegian electronics company Nerion, a competitor of LM Ericsson--was this an isolated event or may we expect similar purchases by the newly started Teleinvest?

"Expansion is not an end in itself. Any purchase must fit into the overall picture of the Telecommunications Service. The purchase of Nerion came about as an interesting opportunity for us to complement our own expertise. We hope to achieve some synergistic effects."

Some people suspect that the Telecommunications Service, instead of properly maintaining the network, transfers large portions of the income for the telephone service to sectors that must compete with other companies. Are you neglecting the network?



According to director general Tony Hagstrom, the number of mobile telephones (NMT) will reach 30,000 in 1985 or 1986.

Key: Number of mobile telephones (NMT)

"No, that is completely false. Let me state first that we invest about 4 billion kronor annually in the network, which may be compared to 45 million kronor required for telefax terminals over several years and 130 million kronor for teletex terminals over several years. The network is of high international quality. We have a failure rate that is 50 percent below most other countries."

"Despite this, criticism has arisen because we have had and continue to have some problems in Stockholm. Availability is poor for calls made to Stockholm and this is due primarily to delayed deliveries of some modern equipment for the data network. For this reason, the telecommunications network has been under greater stress than previously anticipated."

"Another explanation is that we had a loss of personnel from the older stations in Stockholm, resulting in numerous vacancies. At the same time, I must admit openly that we should have reacted more quickly when we saw that the problem began to arise. There is reason to criticize us for not being alert and we at the Telecommunications Service are aware of this. It is about like suddenly making an own-goal at a soccer match."

Many people have accused you of undercutting your competitors and you did not pay sales tax on your telephone answering devices. Why?

"First of all, we have not undercut our competitors and, secondly, we will pay sales tax on our telephone answering devices. There was some uncertainty in this matter previously. The new guidelines transferred telephone answering devices from the monopoly sector to the competitive sector. We do not pay sales tax on our monopoly products and there has been a certain lag on this point, but it is clear that we will pay sales tax."

Why can equipment that is to be connected to the telecommunications network not be tested by an independent agency, for example the National Institute for Materials Testing? What do you gain by conducting the tests within your agency?

"If we at the Telecommunications Service were to view this from a purely business standpoint, we would gladly be rid of the testing. We have been criticized for this repeatedly. We have been commissioned by the state, however, to be responsible for the telecommunications network system in this country and we have a network that is not homogeneous."

"The old network often fails us and, for this reason, we must discover various innovations to make the old technology work together with the new. The overall responsibility for making all this work rests on us."

You see no conflict of interest in the fact that you as an authority test your competitors' equipment?

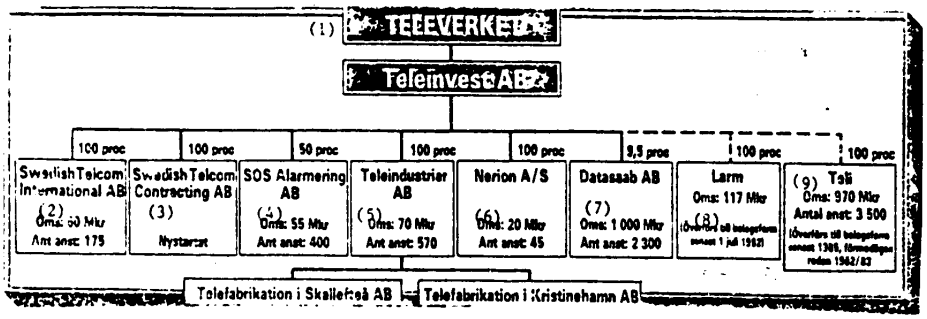
"No, we went through this carefully in connection with the proposal. A telecommunications connection board is now being created that will examine complaints from customers with regard to testing. We hope this will guarantee that everything is done properly. Let us now see how this new system works."

Teleinvest Approaches Billions

Since its beginning in January this year, Teleinvest has grown rapidly to a stable and very important part of the Telecommunications Service. Teleinvest is now one of the agency's most expansive sections. Sales during the fiscal year 1980/81 amounted to 182 million kronor and net profits were 9 million kronor.

Teleinvest was created by parliament to bring those sectors within the Telecommunications Service that must compete with other companies more in line with the market and to help the service keep up with its competitors on a purely commercial basis.

So far the new holding company has only one employee--managing director Sven-Roland Letzen, who is also economic director for the entire Telecommunications Service. The chairman of the board is director general Tony Hagstrom, who is well compensated for this (20,000 kronor per month), for which he has been criticized severely in the mass media.



Key:

1. Telecommunications Service

2. Volume: 60 million kronor
   Number of employees: 175

3. Recently established

4. Volume: 55 million kronor
   Number of employees: 400

5. Volume: 70 million kronor
   Number of employees: 570

6. Volume: 20 million kronor
   Number of employees: 45

7. Volume: 1 billion kronor
   Number of employees: 2,300

8. Alarm Division
   Volume: 117 million kronor
   (to assume corporate form by 1 July 1982)

9. Volume: 970 million kronor
   Number of employees: 3,500
   (to assume corporate form by 1985, probably as soon as 1982/83

In addition to holding stock, the company also manages property. The following companies are included in Teleinvest at present:

Swedtel (Swedish Telecoms International AB), which does consulting work in telecommunications, primarily in developing countries. The consultants come mostly from the Telecommunications Service. Swedtel employs 175 persons and has a business volume of about 60 million kronor.

Swedcom (Swedish Telecoms Contracting AB) is brand new and will do contracting work in developing countries for planning, installing, operating, and maintaining telecommunications equipment. In addition, the company sells the Telecommunications Service's own equipment and products.

Nerion A/S is a Norwegian company recently acquired by Teleinvest. Nerion competes to a marginal degree with LM Ericsson and sells microprocessor-based telecommunications systems under the name GAREX. The system can be adapted for traffic controllers at airports, as well as police, fire, and shore radio stations. Nerion has 45 employees and a volume of 20 million kronor.

Teleindustrier, together with its subsidiaries Telefabrikation in Skelleftea and Telefabrikation in Kristinehamn, has a business volume of 70 million kronor and employs 570 workers. Teleindustrier manufactures equipment and components for the Telecommunications Service.

SOSAB performs a number of basic services for municipalities and county councils such as emergency services, fire and ambulance alarms, and also handles commercial alarm services for industries and security companies.

SOSAB, 50 percent of which is owned by Teleinvest, 25 percent by the Association of County Councils, and 25 percent by the Assocciation of Local Governments, has a volume of 55 million kronor and employees 400 workers.

Teleinvest now owns 9.5 percent of Datasaab, since the Telecommunications Service took over the state's interest, and LM Ericsson owns 90.5 percent.

According to a resolution by parliament, the Alarm Division will assume a corporate form under Teleinvest by 1 July 1982. The Alarm Division has a volume of 117 million kronor and has achieved considerable shares of the market in the fields of intercoms, fire alarms, and burglar alarms.

According to a parliamentary resolution, Teli, the industrial division of the Telecommunications Service, will assume corporate form under Teleinvest by 1 July 1985. There are indications that this will occur already during the fiscal year 1982/83. Teli manufacturers primarily telephone exchanges, private branch exchanges, and telephones, but also alarms, data processing equipment, and air traffic equipment. In addition, some renovation work is also done. The company has a volume of 970 million kronor and net profits of 39 million kronor and the division employs 3,500 workers.

Investments Down Despite Record Profits

From an economic standpoint, the Telecommunications Service is our best run state agency. The 1980/81 fiscal year showed record profits of 2.5 billion kronor--a 29 percent increase, even adjusted to the Telecommunications Service's new bookkeeping system. Profitability during the same period amounted to 12.5 percent.

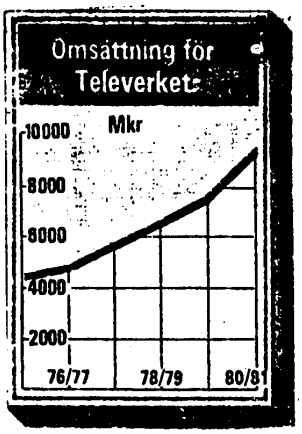
Of the total volume of 9.3 billion kronor, the telephone sector was responsible for 85 percent, while activities such as data and text communications were well under 5 percent each. In addition, 50 percent of the telephone revenues result from charges for calls.

The favorable results are due primarily to increased volume in the telephone sector, which rose by 4 to 5 percent during the 1980/81 fiscal year and sales by 16.6 percent expressed in fixed prices--the greatest increase throughout the 1970's.

The higher profits mean that the Telecommunications Service has now doubled its reserves to 600 million kronor which, in turn, means that new rate increases will not occur for a long time to come.

The Telecommunications Service will need this capital when it introduces its electronic AXE stations, which will require annual investments for many years of 4 billion kronor at today's monetary value.

To manage these heavy investments, the agency has repeatedly requested permission to form its own financing company, Telefinans, in order to go out into the open market and borrow under somewhat more favorable terms. Parliament refused to allow this and instead gave the Telecommunications Service a flexible credit of 800 million kronor with the National Debt Office. The Telecommunications Service has not given up the idea of Telefinans totally, but will make a new application in the near future. While awaiting a response and in order to cope with investments the Telecommunications Service chose instead to reduce the rate of investments, which means that the big cities receive priority, while small towns must wait for the new AXE exchanges.

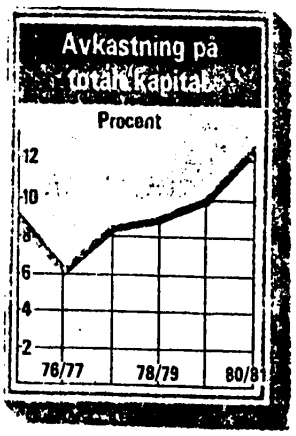


Demand for the agency's services continues to grow. During the 1980/81 fiscal year volume reached 9.3 billion, a 17 percent increase during the year.

Key: Volume of Telecommunications Service (million kronor)

Since economist Tony Hagstrom became director general, the Telecommunications Service's profits have increased from 631 million to 2.544 billion kronor.

Key: Net profits (million kronor)



Like profits, returns on total working capital during the past 5 years have increased from 6.1 to 12.5 percent.

Key: Returns on total capital (percent)

9336
CSO: 5500/2047

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